

### **Remarks**

Claims 16-35 are pending. Favorable reconsideration is respectfully requested.

The present invention is directed to "dispersants" for cementitious compositions. In such compositions, such dispersants, also termed "plasticizers", increase the slump and workability of cementitious mixtures, allowing less water to be added while still retaining workability. As a result, the physical properties of the mortar, cement, etc., are considerably enhanced, at the same time without sacrificing workability.

In the past, perhaps the best plasticizer has been casein, a natural protein which may be obtained from milk products. Casein is noted for its workability and plasticizing action, but suffers from the drawback that since it is a natural protein, it is subject to microbial attack, thus promoting growth of microorganisms on the cement product. The art has long sought a casein substitute which mimics the behavior of casein, but is less subject to microbial growth.

This long sought need has been met by the claimed dispersants which are obtained by polymerizing an ethylenically unsaturated carboxylic acid or an amide, ester, or anhydride thereof (component a)) in an amount of 5 to 70 wt. %; from 1 to 40 weight percent of an unsaturated amount with sulfonate or sulfate functional groups (b)); from 10-80% of ethylenically unsaturated polyoxyethylene glycols (c)); and from 5 to 80% of ethylenically unsaturated polyoxypropylene or polyoxybutylene glycols (d)); optionally also containing 0.5 to 10 weight percent of hydrophobic comonomers. As shown in the examples, these compounds exhibit a plasticizing action very similar to casein, and thus can be directly substituted for casein while being resistant to microbial growth.

Claims 21 and 30 have been rejected under 35 U.S.C. § 112 ¶¶1, 2. Applicants do not acquiesce to this rejection, but have cancelled these claims to expedite prosecution.

Claims 16-23, 25, 27 and 29-32 have been rejected under 35 U.S.C. § 103(a) over *Hirata* EP 0 792 850 A1, which is discussed in the specification on page 2. Applicants respectfully traverse this rejection.

*Hirata* is directed to providing plasticizers which retain their plasticizing properties over long periods of time. *Hirata* does not even mention the problem addressed by Applicants: providing a synthetic (bio-resistant) plasticizer which mimics the desirable products of casein. The plasticizers of *Hirata* are copolymers of an unsaturated carboxylic acid and two specific unsaturated polyoxalkylene polyethers. Additional comonomers may also be copolymerized. The polyoxyalkylene moieties are specifically one of short length and one of long length (i.e., lesser and greater repeating oxyalkylene units, respectively). All the examples of *Hirata* employ only methoxy- polyoxyethylene glycol monomethacrylates with 4 and 23 oxyethylene repeating units. No example of *Hirata* employs any copolymerizable comonomer (*Hirata's* "(d)" monomer).

At page 7, lines 35-47, *Hirata* provides a long list of potential comonomers (d). There is no direction provided as to which, if any, of these comonomers are preferred, and the fact that *Hirata* did not employ any comonomers (d) in any example would indicate to the skilled artisan that these in fact are not preferred.

To arrive at the claimed, inventive dispersants, one would have to select an unsaturated polyoxyethylene glycol moiety and a polyoxy (C<sub>3-4</sub>) alkylene glycol moiety. While *Hirata* discloses a long list of potential polyoxyalkylene-functional short chain monomers, and a correspondingly long list of polyoxyalkylene-functional long chain monomers, these include all of polyoxyethylene, polyoxypropylene, and polyoxybutylene moieties as well as copolymeric moieties for both the short and long chain monomers. *Hirata* does not teach or suggest using different monomers as Applicants require: a polyoxyethylene-functional monomer and a polyoxy(propylene or butylene)-functional comonomer. *Hirata* does not direct one skilled in the art to the use of two monomers with different alkylene moieties in different polyoxyalkylene-functional monomers. Rather, by choosing only polyoxethylene-functional monomers for both *Hirata's* long and short monomers, *Hirata* would lead the skilled artisan away from such a

choice, as it is clear from the numerous examples employing only polyoxyethylene moieties that these represent the best mode of *Hirata*.

Applicants also require a sulfonate- or sulfate-functional comonomer, in an amount of 1-40% by weight. *Hirata* discloses a laundry list of comonomers, as a single comonomer, or two or more of such monomers, the amount not to exceed 50% by weight. The list of monomers on page 7 of *Hirata* includes literally thousands if not hundreds of thousands of individual monomers (d). Moreover, no monomer (d) is indicated to be preferred, so *Hirata* does not direct the skilled artisan to the sulfonate- or sulfate-functional comonomers which Applicants' claims require.

This is not a simple mechanical case such as the *KSR* case, where there was only a very limited choice of possibilities, and the result was predictable. Here, there is no predictability at all, and the number of choices is not limited, as it was in *KSR*, but multitudinous. To arrive at the subject invention, not only must there be a selection of both polyoxyethylene-functional and polyoxy(propylene or butylene)-functional monomers, but also the remaining required comonomer (sulfate- or sulfonate-functional) must be selected from a long list as well. The combinations and permutations of these selections are virtually unlimited.

*KSR* was recently revisited in *Bayer Schering Pharma AG v. Barr Laboratories, Inc.*, Slip Opinion 2008-1282, pp. 8-10 (Fed. Cir., August 5, 2009). As stated in *Bayer*:

[A]n invention would not have been obvious to try when the inventor would have had to try all possibilities in a field unreduced by direction of the prior art. When “what would have been ‘obvious to try’ would have been to vary all parameters or try each of numerous possible choices until one possibly arrived at a successful result, where the prior art gave either no indication of which parameters were critical or no direction as to which of many possible choices is likely to be successful” an invention would not have been obvious. O’Farrell, 853 F.2d at 903. This is another way to express the *KSR* prong requiring the field of search to be among a “finite number of identified” solutions. 550 U.S. at 421; see also Procter & Gamble, 566 F.3d at 996; Kubin, 561 F.3d at 1359. It is also consistent with our interpretation that *KSR* requires the number of options to be “small or easily

traversed.” Ortho-McNeil Pharm., Inc. v. Mylan Labs., Inc., 520 F.3d 1358, 1364 (Fed. Cir. 2008).

Second, an invention is not obvious to try where vague prior art does not guide an inventor toward a particular solution. A finding of obviousness would not obtain where “what was ‘obvious to try’ was to explore a new technology or general approach that seemed to be a promising field of experimentation, where the prior art gave only general guidance as to the particular form of the claimed invention or how to achieve it.” O’Farrell, 853 F.2d at 903. This expresses the same idea as the KSR requirement that the identified solutions be “predictable.” 550 U.S. at 421; see also Procter & Gamble, 566 F.3d at 996-97; Kubin, 561 F.3d at 1359-60.

Here, there is no predictability to providing a plasticizer which mimics the plasticizing effects of casein. Moreover, as stated by the Court in *Bayer*, the prior art (*Hirata*) “gave either no indication of which parameters were critical or no direction as to which of many possible choices is likely to be successful.” In the language of *KSR*, here, there are not a “finite number of identified solutions.” Also consistent with *Bayer*, the prior art does not “guide an inventor toward a particular solution.”

Applicants application contains several comparative examples which should be noted. Comparative powder V2 contained a methoxypolyethylene glycol methacrylate/methacrylic acid plasticizer, i.e., one virtually identical to those of *Kirata*, being different only in that a single polyoxyethylene moiety with 17 moles of repeating EO units is used rather than one with a lesser amount of EO and one with a greater amount of EO.<sup>1</sup>

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<sup>1</sup>It is well known that oxyalkylation of methanol with ethylene oxide to provide a 17 mole oxyethylate always produces a range of oxyethylates having less and also more than 17 moles of oxyethylene groups per molecule. The polydispersity is generally high, and increases with the average number of moles of alkylene oxide added. Thus, a 17 mol oxyethylate will of necessity contain both short and long polyoxyethylene moieties. See, e.g., *Martin Schick*, NONIONIC SURFACTANTS, cited in the prior response, and multitudinous patents dealing with polyoxyethylene polyether synthesis by BASF, Bayer, ICI, etc. This is well known to those skilled in the art.

The comparative examples also compare MELFLUX 1641 plasticizer (*Degussa*) in Table 3 on page 18 with the subject invention compounds. MELFLUX 1641 is a polyacrylic polymer with pendent oxyethylene groups, and is a common and widely used plasticizer. As shown in Figures 1 and 2, the rheology of the system is totally different than when the subject invention plasticizers are used.

Following the *Bayer* case, it should be clear that *Hirata* does not direct one skilled in the art to the present invention. Withdrawal of the rejection over *Hirata* under 35 U.S.C. § 103(a) is thus respectfully submitted.

Claims 24 and 26 have been rejected under 35 U.S.C. § 103(a) over *Hirata* in view of Haerzschel U.S. 6,166,133 ("*Haerzschel*"). Applicants respectfully traverse this rejection.

Claims 24 and 26 pertain to a process of spray drying a polymer dispersion to obtain a redispersible polymer powder, wherein a dispersant of claim 16 is employed as a spraying aid.

*Hirata* as been discussed previously. The Office states that the polymeric dispersant of *Hirata* can be in an aqueous solution, citing page 8, lines 3-20 of *Hirata*. Applicants find no such teaching therein, although Example 1 of *Hirata* indicates that the Example 1 polymer is soluble in water since it is obtained as an aqueous solution. This actually underscores the differences between *Hirata* and the subject invention dispersants, because the subject invention dispersants must contain either polyoxypropylene or polyoxybutylene side chains, both of which are hydrophobic. Applicants polymers are synthesized in the form of a dispersion in water, not a solution in water.

*Haerzschel* is directed to providing polyvinyl alcohol stabilized redispersible polymer powders which increase the flexibility of cured compositions. While cements and mortars are usually regarded as stiff and inflexible following setting, such materials do have some ability to flex. *Haerzschel* intended to increase this flexibility by employing a redispersible

polymer powder of 15-80% vinyl acetate, 5-35% ethylene, and 5-60% of vinyl esters of C<sub>9-11</sub>  $\alpha$ -branched carboxylic acids. The comonomers are copolymerized in water and a dispersion is obtained. If this dispersion is spray dried, the particles agglomerate and coagulate, as the spray drying temperature is almost always above the minimum film formation temperature. Thus, the spray dried powder will not redisperse in water. To provide redispersibility, the particles are coated with a polyvinyl alcohol as a protective colloid, added prior to spray drying. During drying, the polyvinyl alcohol precipitates out of solution forming a film around the polymer particles as water is removed by the drying process. When the dry powder is added to water, the polyvinyl alcohol dissolves, freeing the non-agglomerated particles. The particle size and particle size distribution is substantially the same as that of the polymer initially prepared as an aqueous dispersion. Use of protective colloids in such applications has been known for decades, and is well known to the skilled artisan.

The Examiner references "dispersants" in column 4, lines 1-5 of *Haerzschel*. However, this is a reference to additional components which can be added to cements and mortars as "further additives", not to the use of a dispersant as a spray drying additive. Emulsifiers are also dispersants, for example, and *Haerzschel*'s claims forbid their use.

The polyvinyl alcohol protective colloids of *Haerzschel* are water soluble, in order to provide their "protective" function. Not all polymers can serve as protective colloids, not even all water soluble polymers. For example, polyoxyethylene glycol is water soluble but is not a protective colloid.

*Haerzschel* does not teach or suggest that any polymer other than those he cites can be used as a protective colloid, and *Haerzschel* teaches against the use of emulsifiers. However, due to the large number of pendant oxyethylene groups in *Hirata's* water soluble polymers, there certainly will function as an emulsifier, which *Haerzschel* forbids. See *Schick*, op. cit.

The polymers of Applicants are not protective colloids because they are insoluble in water. As the specification indicates, they are atomization aides. The specification never describes them as protective colloids.

Moreover, it is surprising that spray drying would be effective, as it is well known that the addition of polyoxyalkylene groups to polymers generally create waxy solids of low melting point and low film formation temperature. Thus, one skilled in the art would expect that use of the subject invention compounds to spray dry an aqueous polymer dispersion would create even more agglomeration than when such polymer dispersions are spray dried in the absence of a protective colloid, like spray drying a wax dispersion with a polymer dispersion. Surprisingly, this does not occur. There is no motivation from *Hirata* to use his plasticizers as spraying aides, and no motivation in *Haerzschel* to use such compounds either. Withdrawal of the rejection of claims 24 and 26 over *Hirata* in view of *Haerzschel* is solicited for this reason, as well as for the additional reasons previously discussed regarding *Hirata* alone.

Claim 28 has been rejected under 35 U.S.C. § 103(a) over *Hirata* in view of *Haerzschel* and further in view of Debus U.S. Patent 4,137,088 ("*Debus*").

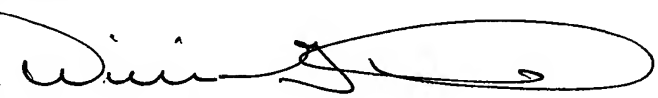
*Debus* teaches flowable screeds based on anionic polyelectrolytes and at least one low-foaming surfactant. *Debus* does not supply the deficiencies of *Hirata* and *Haerzschel*. Moreover, *Debus* requires a low-foaming surfactant (emulsifier; see column 3, lines 15-43 - all these are well known emulsifiers). *Haerzschel* requires that no emulsifier may be used. *Haerzschel* and *Debus* are not properly combinable, as they teach in opposing directions. Withdrawal of the rejection of claim 28 is respectfully solicited.

Applicants submit that the claims are now in condition for Allowance, and respectfully request a Notice to that effect. If the Examiner believes that further discussion will advance the prosecution of the Application, the Examiner is highly encouraged to telephone Applicants' attorney at the number given below.

Respectfully submitted,

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By



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